

9.7 WESTERN FLHD PROCEDURE

Section 9.6 STANDARD FORMAT - Subsection A. Plans. Replace the text with the following:

Purpose. Project plans as described under Section 9.4.I should be prepared using the guidance provided in this section. Following these guides will produce plan sheets that are accurate, neat, presentable, and that will reproduce legibly.

The following sections detail the format, drafting standards, and organization of the plan sheets into a PS&E assembly.

1. Format. Prepare all plan sheets using a CADD system. MicroStation from Bentley is the current FHWA standard CADD package. There may be some exceptions, e.g., conceptual drawing, architectural renditions, emergency projects, etc., to accommodate special needs of internal sections or cooperating agencies, but these should be few in number. When manual drafting becomes necessary, it should be accomplished in a manner that duplicates the appearance of CADD drafting to the extent possible.

[Figure H](#) contains sample plan sheets prepared using the guidance in this section. Hand-shaped symbols show the recommended fonts (FT), text sizes (TX), line style (LC), and weights (WT) to be used in the preparation of the plans.

Place a margin block containing the designer's name, checker's name, filename, and date on each project specific plan sheet.

2. Drafting Standards. The use of drafting standards establishes uniformity and quality in the drafting of contract plans.

When a CADD system is used to develop plans, the dexterity of a manual drafter is no longer critical; letter spacing is correct and lines are uniform throughout their lengths. However, a CADD system operator must have the same knowledge of drawing layout and detailing as a manual drafter to produce a good drawing. The CADD operator must use care in laying out details when placing text on a plan sheet. The relationship between the text and what it applies to must be clear.

Notes on plan drawings should clarify the drawing and provide necessary information for a complete understanding of the work. Notes shall be clear, concise, descriptive, and as brief as possible to convey the message. Do not include on the plan sheets any instructions covered in the specifications or information that would be more appropriate in the specifications.

Proper spacing between figures, symbols, and words will assure clarity, improve neatness, and increase accuracy.

Deviations from these guidelines are acceptable provided basic drafting practices are followed, and the deviation will improve the drawings. There are situations where the size and weights should be adjusted to emphasize or clarify specific information on a plan sheet. For example, centerline stationing along the plan alignment may require a heavier weight for clarity where culture or other background data tends to clutter the drawing.

a. Line Work. Use line weights to accent the proposed construction work. Make a good, clear delineation of all lines so the proposed work will stand out in contrast to existing features.

Do not draw hidden contours under a structure with the long dash line style (LC=3). Use the medium dash line style (LC=2) instead. Show hidden lines of structures with the same style.

Do not place lines, hatching, or patterning through words or figures. Place hatching at approximately 45 degree angle to the object being hatched.

See [Figure F](#) for standard line weights, styles, and colors.

b. Lettering. When placing text on plan sheets, do not crowd other information. Carefully choose locations for text labels that are as close as possible to the point of application. In general, show text labels identifying proposed work one line weight heavier than the text for existing features. Place text in a manner such that it is not upside down. Text is to be legible when the plan set is oriented either 1) with the binding on the left side of the plan set or 2) with the binding on the top of the plan set (rotated 90 degrees clockwise).

Do not use the letters "I," "O," "N," or "Z" as cross-section indicators. I and O resemble symbols shown on drawings and N and Z are the same shape, but oriented 90 degrees. When you reach the end of the alphabet, use AA, BB, etc. Place the section letters at the end of the section arrow, not on one side.

Use abbreviations on plan and profile sheets only where there is not enough space to spell out the word. In instances where the meaning of an abbreviation appears doubtful, the word should be spelled out. Do not capitalize abbreviations unless the word or words represented are ordinarily capitalized, or unless the abbreviation itself has become established as a capital letter, such as N for north. A period usually follows each part of an abbreviation that represents a single word. This aids in quick interpretation of an abbreviation, such as "a.m.", not "am". The exception to a period following an abbreviation is with units of measure where periods are not used. The abbreviations shown on the "Plan Symbols & Abbreviations" sheet in Figure P have been adopted for use on plan sheets.

Use fonts 2 and 24 for most plan sheets. Other fonts are available and may be used as indicated in [Figure A](#).

Figure A
Usage of Text Fonts

Font (FT)	Usage
2 (Vertical)	Use for features and conditions that currently exist on the ground
24 (Italic)	Use for quantities and instructions for work being constructed under this contract.
3 (Uniform spacing)	Use in tables where uniform letter spacing is desired.
47 (Hollow)	Use on NPS title sheet
81 (Century)	Use on non-NPS title sheet
85 (Geometric)	Use for title block text
91 (Ribbon)	Use for signature block on title sheet
92 (Swiss)	Use on title sheet
95 (Swiss bold)	Use on title sheet

Standard lettering sizes are shown in [Figure B](#). Text line spacing (LS) should generally be half of the text size.

Figure B (Metric) Lettering Sizes (TX)				
	Plot scale			Less used
Standard size Scale	1:2000	1:1000	1:400	1:500
Corresponding Full size Scale	1:1000	1:500	1:200	1:250
Minimum text size	2	1	0.4	0.5
File location and date	2.5	1.25	0.5	0.625
Sheet number block	3	1.5	0.6	0.75
Small text	3.5	1.75	0.7	0.875
Normal text size	4	2	0.8	1.0
Large text	4.5	2.25	0.9	1.125
Drawing headings	5	2.5	1	1.25
Standard/Detail Title block text	6	3	1.2	1.5
	7.5	3.75	1.5	1.875
Title block text	9	4.5	1.8	2.25
Plan/Profile length (m)	700	350	140	175

NOTE: Multiples of the plot scales (1:4000, 1:20, 1:100, etc.) are also acceptable.

Figure B (English) Lettering Sizes (TX)				
	Plot scale			Less used
Standard size Scale	1" = 200 ft	1" = 100 ft	1" = 40 ft	1" = 60 ft
Corresponding Full size Scale	1" = 100 ft	1" = 50 ft	1" = 20 ft	1" = 30 ft
Minimum text size	8	4	1.6	2.4
File location and date	10	5	2	3
Sheet number block	12	6	2.4	3.6
Small text	14	7	2.8	4.2
Normal text size	16	8	3.2	4.8
Large text	18	9	3.6	5.4
Drawing headings	20	10	4	6
Standard/Detail Title block text	24	12	4.8	7.2
	30	15	6	9
Title block text	36	18	7.2	10.8
Plan/Profile length (ft)	3000	1500	600	900

NOTE: Multiples of the plot scales (1" = 20 ft, 1" = 400 ft, etc.) are also acceptable.

Place text labels with a leader line and filled arrowhead by using the built-in "Place Note" function. Use the default arrowhead terminator (terminator geometry width equal to 1 and height equal to 0.5) with a size proportionate to the text being placed, rather than special custom terminators. This increases drafting speed and maintains uniformity. Use "Footnotes" to supplement labels where insufficient space is available at the label location. Use "Notes" for general information that is relevant to the entire sheet. Do not use the term "General Notes". When possible, place Notes and Footnotes on the right hand side of the sheet with Notes placed above Footnotes.

Write numbers with commas separating millions or thousands (i.e. 99,999 rather than 99999 or 99 999).

c. Color. Color may be used to clarify complex plan and profile sheets. Color plan and profile sheets should be considered for complex projects. When used, color plan sheets should be distributed for plan reviews and construction sets. Color plans will not normally be distributed to bidders. Shades of grey may also be used to clarify plan sheets. Standard colors to be used for colored plan and profile sheets shown in [Figure C](#). The WFLHD color plotters are set to “fade” and/or turn “gray” the existing features (Levels 6-12, 14-17, 20-21).

Figure C
Standard Colors

<u>CADD</u> <u>Color</u>	<u>Plotted</u> <u>Color</u>	<u>Feature</u>
CO = 0	Black	Information not listed below
CO = 1	Blue	Water (river and streams) (LV = 5)
CO = 2	Green	Trees (LV = 5)
CO = 3	Red	Proposed centerline (LV = 29-32), construction cut and fill limits (LV = 40), and profile grade (LV = 55)
CO = 5	Pink	Proposed ROW (LV = 47)
CO = 0	Gray	Existing features (LV = 6-12,14-17)
CO = 137	Brown	Major contours (LV = 20)
CO = 6	Orange	Minor contours (LV = 21)

d. Levels. Place all elements on the levels identified in [Figure F](#).

e. Stationing. Do not use "Station" or “Sta” as a prefix to station numbers. Any numbering including a plus sign (for example 2+959 or 30+00) is understood to be a station number.

f. CADD Filenames. Most plan sheets are created with references to other files which contain the planimetrics (existing ground features), contours, and new work.

Planimetric files have an extension of **PLM**. WFLHD color plotters are set to plot the existing features (levels 6-12, 14-17) “gray”.

Contour files have an extension of **CON**. These files contain the surface lines representing points of the same elevation. WFLHD plotters (black/white and color) are set to “fade” the contours in levels 20 and 21.

All other CADD files should have the default extension **DGN**. The filenames should contain a descriptive reference to the project number as shown in [Figure D](#).

Figure D
CADD File Naming Conventions

	<u>Forest Highway</u>	<u>Park, Refuge Road</u>	<u>Other</u>
Project Number	AK PFH 9-1(5)	WY PRA YELL 10(6)	MT OMAD 18(33)
State/Park/Program	Alaska	Yellowstone NP	Missile Road
Highway Route	9	10	18
Segment of Route	1	N/A	N/A
Project Number	5	6	33
CADD Filename	AK0915xx.DGN	YELL1006xx.DGN	OMAD1833xx.DGN

Note: The “xx” refers to the sheet letter designation shown in [Figure E](#).

Figure E
Sheet Letter Designations

AA-AZ	Title and Cover Sheets	LA-LZ	Line Graphs
BA-BZ	Vicinity Maps	MA-MZ	Material Sources
CA-CZ	Typical Sections	NA-NZ	Temporary Traffic Control
DA-DZ	Summary of Quantities	OA-OZ	<<< Skipped >>>
EA-EZ	Drainage Tables and Details	PA-PZ	Permanent Traffic Control
FA-GZ	Plan-Profile Sheets	QA-UZ	Miscellaneous Details
HA-HZ	Horizontal Alignments	VA-VZ	Vertical Alignments
IA-IZ	<<< Skipped >>>	WA-WZ	<<< Skipped >>>
JA-KZ	Right-of-Way	XA-ZZ	Cross Sections

Example

<u>Filename</u>	<u>Description</u>
AK0915AA.DGN	Title Sheet
AK0915AB.DGN	Plan Symbols and Abbreviations Sheet
AK0915BA.DGN	Vicinity Maps
<unfinished>	

Figure F
LEVEL ASSIGNMENTS

Sheet 1 of 4

MAPPING FILES (? .PLM and ? .CON)						
LV	DESCRIPTION	CO	WT	LC	FT	
1	Grid for N-E coordinates (PLM)	0	1	0	2	
2	Control points, monuments, and hub & tack (PLM)	0,3	1,2	0 & CL	2	
3	Jump hubs and traverse points/lines (temporary survey control) (PLM)	0,3	1	0,4 & CL	2	
4	Labels for planimetrics (level 14 & misc info) (PLM)	0	1	0	2	
5	Rivers, streams, wetlands, and lakes (PLM)	0,1,2	0,1	CST & CL		
6	Existing utilities (electric, gas, phone, etc) (PLM)	0	1	CST & CL		
7	Labels for utilities (PLM)	0	1	0	2	
8	Existing manmade hydraulics (ditches, culverts, drop inlets, manholes, etc) (PLM)	1	1	CST		
9	Labels for hydraulics (PLM)	0	1	0	2	
10	Land-lines (property lines, corners, etc) (PLM)	0,2	0,4	CST		
11	Labels for land-lines (PLM)	0	0	0	2	
12	Existing R/W alignment (PLM)	3	0	CST		
13	North arrow, label, legend (PLM)	0		CLS		
14	Planimetrics not shown on 15, 16, 17 (ie guardrail, railroad, and trails) (PLM)	0	0	CST		
15	Existing fences & buildings (PLM)	0	0	CST		
16	Existing roadway (shoulder (co=0) & edge of pavement (co=4)) (PLM)	0,4	1	3		
17	Existing mailboxes, signs, and traffic control (PLM)	0	0	CL		
18	Misc. - scarp lines, rock lines, etc.. (PLM)			CST		
19	Geopak DTM input (S&M)	70		0		
20	Index contours (CON)	137	2	0	2	
21	Intermediate contours (CON)	6	1	0		
22	Spot Elevations, bench marks (S&M)					
23	Scan lines for x-sections (S&M)					
24	Discontinuity lines (S&M)					
25	High and low points (S&M)					
26	Geopak DTM voids (S&M)					
27	Miscellaneous survey info (S&M)					
28	Existing Vegetation (PLM)	2	1	CST		
29	P-line					
30						
31						
32						
33						
33						
33						
34						
35						
36						
37						
38						
39						
40						
41	Boring log symbols (PLM)	0		CLS		
42	Boring log labels (PLM)	0			2	
43						
44						
45						
46						
47						
48						
49						
50						
51						
52						
53						
54						
55						
56						
57						
58						
59						
60						
61						
62						
63	RESERVED- DO NOT USE					

LEGEND

LV	Level
CO	Color
WT	Weight
LC	Line Style
FT	Font
CST	Set by Custom Line Style
CL	Set by Cell
D/C	Set by D&C Manager
CON	Contour File
PLM	Planimetrics File
S&M	Surveys and Mapping

Figure F
LEVEL ASSIGNMENTS

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HORIZONTAL ALIGNMENT FILES (? H_.DGN)

LV	DESCRIPTION	CO	WT	LC	FT
1					
2	PI location (suggested)*				
3	Original tangents (suggested)*				
4	Original curves (suggested)*				
5					
6					
7					
8					
9					
10					
11					
12					
13	Sheet setup-clipping blocks for plan & profiles, title blocks, grid	2,3	0	CL	
14					
15					
16					
17					
18					
19					
20					
21					
22					
23					
24					
25					
26					
27					
28					
29	Tick marks and stations	3	1,3	0	24
30	Horizontal alignment - centerline	3	6	0	
31	Curve information	3	1	0	24
32	Curve labels and bearings	3	1	0	24
	Pavement markings (634 item)	D/C	D/C	D/C	D/C
33	Proposed widening- A,B,C,D,E,F and Shoulder widening (PRXS)	4-9,18		0	
	Proposed PCC curb (609 item)	D/C	D/C	D/C	D/C
34	Proposed hydraulics (601 to 608 items)	D/C	D/C	D/C	D/C
	Proposed drainage	1	3	CST	
35	Proposed guardrail (PRXS)	7		CST & 0	
	Guardrail and termini (617 item)	D/C	D/C	D/C	
36	Proposed fence (619 item)	D/C	D/C	CST & D/C	
37	Proposed walkways (615 item)	D/C	D/C	CST & D/C	
38	Proposed walls, gabions, etc (255 item)	D/C	D/C	D/C	
39	Proposed landscaping, plantings, etc (Note-CL on LV=5)	2		CL	
40	Construction limits (cut/fills/transitions)	3	3,3,1	1,3, 4	
41	Soil borings (plan)	0		CL	
42	Proposed signing (word descriptions)	0	1	CL	2
43	Proposed pavement markings, delineators, etc.	0		CL	
44	Proposed utilities - user defined	0		CST	
45	Proposed utilities - user defined	0		CST	
46	Proposed utilities - user defined	0		CST	
47	Proposed right-of-way	5	0	CST	
48	Ownerships, addresses and takings	0	1		2
49	Edge of travel way (PRXS)	18			
50	Construction easements	5	0	CST	
51	Erosion control devices (157 item)	D/C	D/C	D/C	
	Patterns (PRXS)*- this is generally a separate file				
52	Saw cut pavement, Roadway obliteration (203, 211 items)	D/C	D/C	D/C	
53	Approach road match line	1		1	
54	Proposed construction traffic control				
55					
56					
57	Rock line (PRXS)	57			
58	Walls (PRXS)	58			
59					
60	Dimensions (LD=60)				
61	As-constructed data				
62					
63	Filled shapes (PRXS) - this is generally in a different file				

* Designer has option of using multiple files for this information.

Figure F
LEVEL ASSIGNMENTS

Sheet 3 of 4

VERTICAL ALIGNMENT FILES (? _V_.DGN)					
LV	DESCRIPTION	CO	WT	LC	FT
1					
2					
3					
4					
5					
6					
7					
8					
9					
10					
11					
12					
13					
14					
15					
16					
17					
18					
19					
20					
21					
22					
23					
24					
25					
26					
27					
28					
29					
30					
31					
32					
33					
34	Hydraulics data-profile*				
35					
36					
37					
38					
39					
40					
41					
42					
43					
44					
45					
46					
47					
48					
49					
50					
51					
52					
53					
54					
55	Proposed profile grade with labels	4	3,1	0	23
56	Existing ground line profile	2	1	2	
57	X & Y axis labels	4	0,2	0	0,1
58	Quantities i.e.: earthwork balance (profile)*				
59	Soil boring-profile*				
60					
61					
62					
63					

*User discretion

Figure F
LEVEL ASSIGNMENTS

Sheet 4 of 4

CROSS SECTION FILES (? X_ to ? Z_.DGN)					
LV	DESCRIPTION	CO	WT	LC	FT
1	General notes & annotation	0,3	1	0	
2	Pavement structure	0	1	0	
3	Pavement structure-pavement 1	3	1	0	
4	Pavement structure-pavement 2	4	1	0	
5	Pavement structure-base 1	5	1	0	
6	Pavement structure-base 2	6	1	0	
7	Pavement structure-base 3	7	1	0	
8	Pavement foreslopes	244	1	0	
9	Subexcavation	22	1	0	
10	Fill/cut slopes	10,16	1	0	
11	Wall Backslopes - from input file				
12	Wall Backslopes - from input file				
13					
14					
15	Permeable (EARTHWORK)*	15			
16	Additional wall fill (EARTHWORK)*	16			
17					
18					
19					
20					
21	Centerline & station text	8,0	1	0	23
22	Design Grade elevation text	0	1	0	23
23	Subgrade elevation text	0	1	0	23
24	Original ground elevation text	0	1	0	23
25	Special earthwork - Riprap				
26	Special earthwork - Rock Embankment				
27	Special earthwork - Wall Fill				
28					
29					
30	Slope and super text	7,3	1	0	23
31					
32					
33					
34	Culverts and notes	3			
35	Guardrail cells	20	1	0	
36					
37					
38					
39					
40					
41					
42					
43	Excavation limits	0	1	0	
44					
45					
46	Existing suitable-Structural Excavation,(EARTHWORK)*	46			
47					
48					
49	RP symbol cell (Scale to 0.3 or 0.1)*	1,4	0	0	3
50	Codes for producing centerline staking notes	0	1	0	23
51	Right-of-way symbol cell (Scale to 0.3 or 0.1)*	0,13	0	0	3
52	Cut & fill - earthwork shapes	1,2-5,7,11			
53	Edge of water labels				
54					
55	Text for existing roadway	3	1	0	23
56	Existing ground (EARTHWORK)*	2	0	3	
57	Topsoil	2	3	2	
	Existing Pavement	3	1	0	
	Existing Suitable - Roadway Excavation (EARTHWORK)*	57			
	Rock line (EARTHWORK)*	57			
58					
59					
60	Codes for producing grading notes	60	1	0	23
61	Information to create cross sections (can be deleted)	2,3,61	1,3	0	23
62					
63	XSCCELL (Do not delete-reference for cross section location)	2	1	1	0

*User discretion

3. Organization of Plans. Organize plan sheets to show a logical progression of the project work. Group plan sheets according to their type and give each section a sequential letter.

Follow the section order shown in [Figure G](#). Reserve Sections A, B, C, and D for the categories shown. Section E and following may be modified or deleted as applicable to the specific project. Other sections may be added as necessary. Sections should have sequential lettering. Designers should decide on an arrangement that best fits their needs within the guidelines. For instance on a project which consists only of scattered work sites it may be advantageous to have a section for each site.

Number plan sheets consecutively within each section. Place tabulation of quantity sheets at the beginning of the section that shows the work item except as noted. The following discussion describes the content of the major sections.

a. General Information. (1) Title Sheet. The *Title Sheet* serves to identify the location and limits of the project so bidders can find it in the field. Descriptive terms appearing on the title sheet should be readily identifiable by the topography, culture, or by use of State highway maps. The following items should be included on the title sheet:

- ' Title and project designation
- ' Project length
- ' State, county, city/town, National Forest/Park, etc.
- ' Key map of the State showing project location
- ' Index of sheets
- ' Design classifications such as the current Average Daily Traffic (ADT), design year ADT, directional distribution (D) when available, percent trucks (T) when available, design speed (V) and maximum superelevation rate (e)
- ' Design consultant logo (if applicable)
- ' Provisions for dates and signatures of the appropriate approving officials
- ' Standard specifications to be used on the project
- ' Project Location Map (See below for more details)

Prepare the project vicinity map using a scale ratio of 1:100,000 or larger. Show the project area, the nearest towns appearing on a State highway map, other roads, railroads, major streams, etc. In instances where sufficient information cannot be placed on the project vicinity map to adequately identify the project work, prepare additional vicinity maps on separate sheets. Additional details that help to clarify the limits of the work or provide data needed to conveniently bid the work are encouraged. In addition to the above information, show the following on the project vicinity map:

- ' Distance from the project to nearest cities and towns linked to project termini
- ' North Arrow
- ' Location Map scale bar
- ' Beginning and ending stations or termini
- ' Schedule boundaries (when applicable)
- ' Material sources (when applicable)
- ' Disposal sites, stockpile sites, and storage areas (when applicable)
- ' Water sources (when applicable)
- ' Offsite Mitigation (when applicable)

Figure G

INDEX TO SHEETS	
A. GENERAL INFORMATION	All projects
A.1 Title Sheet	
A.2 Plan Symbols and Abbreviations	
A.3 Vicinity Map	<i>As applicable</i>
B. SUMMARY OF QUANTITIES	All projects
B.1-? Summary of Quantities	
C. TYPICAL SECTION	All projects
C.1 Tabulation of Typical Section Quantities	<i>Typical Sections and Tabulations</i>
C.2 - ? Typical Sections	<i>may be on same sheet</i>
D. PLAN-PROFILE	All projects; may be renamed "LINE GRAPH" or other type of plan sheets as applicable.
D.1 Tabulation of Plan-Profile Quantities	<i>Option: Approach Roads could be shown here or in separate section</i>
D.? Grading Summary (if applicable)	
D.? - ? Plan-Profile Mainline	
D.? - ? (Others if applicable)	
E. APPROACH ROADS AND PARKING AREAS	<i>Option: Could be split into two or more sections</i>
E.1 Tabulation of Approaches and Parking Area Quantities	
E.2 - ? Parking Area Plan	
E.? - ? Parking Area Details	
F. EROSION CONTROL	
F.1 Tabulation of Erosion Control Quantities	
F.2 Erosion Control Plans	
F.3 Section 157 Standard Drawings	
G. MATERIAL SOURCES	
G.1 Material Source Details	
H. DRAINAGE	
H.1 Tabulation of Drainage Quantities	
H.2 Drainage Cross-Sections	
H.3 - ? Section 602 Standard Drawings	
H.? - ? (Other standard plans as appropriate)	
I. SAFETY FEATURES	
I.1 - ? Section 617 Standard Drawings	
I.? (Other concrete barrier or guardwall drawings)	
J. FENCES, GATES, AND CATTLE GUARDS	<i>(Same format as previous section)</i>
K. MISCELLANEOUS	<i>(Drawings that fit no where else)</i>
L. WETLAND MITIGATION	
L.1 Tabulation of Wetland Mitigation Quantities	
L.2 Wetland Mitigation Plans	
L.3 Wetland Mitigation Details	
M. LANDSCAPING PLANS	
M.1 Tabulation of Landscaping Quantities	
M.2 - ? Landscaping Plans	
M.? Landscaping Details	
N. TEMPORARY TRAFFIC CONTROL	
N.1 Tabulation of Temporary Traffic Control Quantities	
N.2 Detour Plans	
N.3 Temporary Signing	
N.4 Temporary Traffic Control Details	
O. PERMANENT TRAFFIC CONTROL	
O.1 Tabulation of Permanent Traffic Control Quantities	
O.2 Signing and Striping Plans	
O.3 Signing and Striping Details	
P. BRIDGE CONSTRUCTION DETAILS	
P.1 - ? Bridge Drawings	

(2) Plan Symbols & Abbreviations. The *Plan Symbols & Abbreviations* sheet details all of the standard plan symbols and abbreviations currently in use by the WFLHD. The current symbol sheet is called **plansym.dgn**. For mapping created prior to 1999 use **oldplnsym.dgn**. The symbols sheet was developed using the actual cells from the work_dd cell library. Scale and cell name may be determined using Microstation's command "element information" on symbols in this sheet.

When a special symbol is required that is not included on this sheet, show it in a legend on either the first plan sheet where the symbol appears or on the left side of the first plan-profile sheet. Abbreviations not shown may be placed on the plans similar to the way symbols are placed or may be added to the contract as a special contract requirement under Subsection 101.03 Abbreviations.

The symbols and abbreviations should not be changed on a project-to-project basis. When a change is required in the Plan Symbols & Abbreviations sheet to satisfy WFLHD's needs, change the master file so all future projects will have the same symbols and abbreviations. This prevents the need to check all the data on the sheet for every project.

b. Summary of Quantities. The *Summary of Quantities* tabulates, combines, and summarizes the contract quantities for all pay items. This summary informs prospective bidders where to locate work within the plan sheets, the difference between plan quantities and bid schedule quantities, if any, and expands on contract bid schedule information. It also serves as a helpful checklist to the designer to ensure that all elements of the design receive consideration.

This is generally one of the last plan sheets prepared in final form. The contents of this sheet are automatically generated using the Engineer's Estimate program. All the pay items are listed in numerical order and identified by appropriate descriptions. The bid schedule quantities duplicate those in the contract. Show any pertinent information by the use of remarks or footnotes at the bottom of the summary plan sheet. Items of work paid for under the contract quantity provision of Section 109 should be identified when preparing the engineer's estimate.

c. Typical Sections. The *Typical Section* shows the shape of the finished cross-section with the construction limits, and represents the appearance of the completed project. It must be specific enough to describe the proposed work, its location, and material needs. Identify all functional elements of the typical section to a relative scale. Show widths in meters (feet) and show thickness or depth in millimeters (inches).

Use standard terminology matching the FLH Standard Drawings and the FP for features and pay items. Identify the following on the typical section:

- ' Indicate the location of the "Travel Way" and "Shoulder" on all sections where applicable
- ' Identify the typical section as being either mainline or a specific approach road, along with the applicable stations (if more than one section), or companion site name by including a subtitle with each typical section.
- ' Use a "bubble" detail to clarify complex pavement structures.
- ' Use the full FP item name to call out pavement structure features.
- ' Where an additional section uses the same pavement structure as the mainline, reference the mainline typical for surfacing depths (i.e. See Mainline Typical). This will reduce errors should the typical sections change during the development of the design.
- ' Include a curve widening table on the typical section if applicable. No slope ratio table is required.

Provide a slope rounding detail separate from the main line typical section. Show details for both the cut and fill slope rounding. Separate details eliminates the need to duplicate these details on each typical section. Generic typical sections may be used to show different pavement structures and/or lane width/shoulder dimensions in one section to reduce the number of typical sections. Generic sections should be identified by TYPE (i.e. "Type 1" and "Type 2") using a table to describe the approach road station, type, class, roadway width, radius', etc...

Include the following notes as applicable:

- ' Maximum superelevation on curves are at the rate 'e' as indicated on the Plan and Profile curve data.
- ' Construct slopes as shown in the Staking Report Data Listing (see FAR 52.236-4).
- ' For cut heights less than the behind slope rounding distance (B), reduce the B dimension to the cut height dimension and reduce the front slope rounding distance proportionally.
- ' Areas to be topsoiled are shown in the seeding report (see FAR 52.236-4).
- ' Curve widening is applied to the travel way and is reflected in the field notes.

Place the tabulation of pavement structure quantities either on the typical section or on the first sheet of this section. Show the estimating values (i.e. t/m3, lb/ft3) in the table for each item. (Refer to the Project Development Manual Section 9.4.J. for the appropriate significant figures.) See Plan-Profile Tabulation of Plan Quantities section for more information on tables.

d. Plan-Profile. Under this subject area, the designer may incorporate plan and profile sheets, plan sheets, line graphs, or other descriptive sheets which describe the proposed work.

(1) Tabulation of Plan Quantities. Place quantity tabulations for items pertaining to the plan sheets (for instance roadway obliteration, roadway excavation, guardrail, fence) either on the first plan sheet or on a separate tabulation sheet before the plan sheets. These tables aid the bidders in precisely locating the work areas and determining the effort required to perform the work.

Tabulation of quantities sheets consists of detailed summaries of work items presented in a tabular or table format. It provides bidders with more detailed information on the location and extent of the work required than can be shown on the summary of quantities sheet. Tabulations should show how a quantity is developed, not just repeat the quantity shown in the Summary of Quantities. Tables may either be drawn using CADD software or created in a spreadsheet made to look like a normal plan sheet. The WFLHD cell library (work_dd.cel) includes a table cell called "table3" which may be used or referred to as a guide. Sample spreadsheets are also available as guides.

(2) Plan and Profile. Plan and profile sheets should be prepared at a scale that is adequate to show the necessary details as governed by the topography and the complexity of the work. Plans usually have a horizontal scale of 1:2000 (1" = 200 ft) when prepared on a standard size sheet. Larger or smaller scales may be used depending on the amount of detail to be shown. Profiles usually have the same horizontal scale as the plan, but the vertical scale should be 5 or 10 times that of the horizontal scale.

When laying out plan and profile sheets, avoid dividing major structures, highway intersections, interchanges, or grade separations between sheets. Use supplemental sheets as necessary to make these drawings as clear as possible. Leave approximately a third of the first plan-profile sheet blank. Leave a similar blank space after the end of project on the final plan-profile sheet. Use the blank space on the first plan-profile sheet for project specific legends, utility information (name, type, contact and phone number) and other miscellaneous information beneficial to the contractor. Except for the first and last sheet attempt to place 700 meters (3000

feet) on a sheet, at 1:2000 scale (1"=200 ft), and always break sheets at even 100 meter station (10 stations) numbers. Increasing stationing should run from left to right.

(3) Plan View. Show the following information on the plan view:

- ' A prominent **North arrow** for orientation on each sheet.
- ' All boundary lines, State, county, city, township, and section lines. Where ties are shown to section corners that fall off the sheet, break the line and show the corner with tie distance. Describe found corners and show their coordinates. Also show streams, lakes, swamps, estuaries, etc.
- ' Include contours on complex projects on an as-needed basis. Fade or fade and color contours when plotted.
- ' When available show control point (CP) coordinates in a Control Point Table. Use a CP symbol and symbol number on the plan view.
- ' Station coordinates and elevation of the beginning of the project and the end of the project on the first and final plan-profile sheets, as appropriate.
- ' Include clear and concise labels and notes in the plan view. Ensure they are short and to the point. Utilize special details and special contract requirements to clearly define the work to be performed.
- ' On all sheets show the cut and fill slope limits, access control lines, easements, and right-of-way lines. Within the right-of-way, show all cultural features requiring relocation, such as utilities and fences (when not on the right-of-way line). Identify all ownerships for right-of-way purposes. Show all drainage structures. Show any cultural features adjacent to the right-of-way that may be affected by the project.
- ' Curve data consisting of delta angle, radius of curve, tangent length, length of curve, and super-elevation should be shown. Curve widening may also be shown at this location. For spiral transitions, the spiral angle and length of spiral should be shown. Identify every 100 meter station along the centerline. Show bearings of all tangents.
- ' Show the location of borings, test pits, or other sites where subsurface investigations have been made on the plan portion of the plan-profile sheet. Do not show actual log or test results on the plan-profile. Use separate plan sheets for this data.
- ' Graphically show the proposed locations of culvert pipe (drawn to approximate skew), guardrail, wall, and other proposed work items. Where these items are called out in the profile view, no note is necessary in the plan view. Call out proposed work items either in the plan or profile view. Show exact station limits of proposed features in tables where applicable.
- ' Call out removal items and roadway obliterations with a note and show in a table as applicable.
- ' Include contours on complex projects on an as-needed basis. Fade or fade and color contours when plotted.
- ' Include companion site's (turnouts, parking areas, etc.) centerline, outline, and cut/fill limits. Include approach road symbols. (See Detail WM-999.)

(4) Profile View. On the profile portion of the plan-profile sheets show the profile grade and existing ground lines. Place a note indicating the profile grade and existing ground lines. Show gradients on the profile to four decimal places, grade elevations to three decimal places (two decimal places for English units), and natural ground points (if any) to two decimal places. Show vertical and horizontal clearances for railroads, highways, and streambeds under proposed and existing structures.

Also show the following information on the profile view:

- ' Identify locations for items such as underdrain, subexcavation, and special ditches within the profile view with a bar graph (preferred) or plan view (acceptable). Show exact stations, lengths, elevations, and other information in a summary.

- ' Place a note at the approximate locations of pipe culverts listing the size of the pipe culvert. It is not necessary to show a symbol for the pipe culvert. Note exact station and lengths in drainage summary. Include Q25 and HW/D ratio for 1200 mm (48 inch) culverts and larger.
- ' Show bridges and major structures to be constructed on the plan and profile in outline only, with a note to see the appropriate drawings.
- ' Show the approximate location of guardrail on profile by using a bar graph. Use circles at end of bars with notation stating terminal end section type. Exact stationing is not required on the profile, but should be placed in a summary.
- ' Include a quantity bar showing excavation and embankment quantity. Use a grading summary to clearly show where the material is generated (i.e. subexcavation, cut, wall excavation, select borrow, etc...) and how much of the excavation is topsoil, waste, etc...
- ' Show proposed work items which have not been called out in the plan view.

e. Associated Roadways. Plans, profiles, and details for approach roads, parking areas, turnouts, and other associated roadways may be placed in a single section or in multiple sections as appropriate. It may be appropriate to include approach road plans with the mainline plan and profile sheets. The designer should make the plans clear to the intended audience.

Use unique stationing for designed approach roads and secondary roads. Ensure that the stationing is different than stationing found on the mainline (i.e. the first approach road begins with 1+000, the second approach road begins with 2+000, etc...). Label matching stations where the designed approach road or secondary road intersects the mainline (i.e. M.L. Sta. 23+59 = Appr. Sta. 1+00). Either use the abbreviations "M.L." and "Appr." defined on the Standard Symbols and Abbreviation sheet, or use the roadway names.

Provide elevations and coordinates for critical points within parking areas, if centerline and staking notes are not provided. Include note stating "Elevations shown are to finished grade unless otherwise noted."

f. Erosion Control. The plan sheets for the erosion control plan are special drawings and/or standard detail drawings that detail the measures required to protect resources and to comply with permit stipulations. The plan sheet details should reflect Best Management Practices (BMP); comply with Erosion and Sediment Control on Highway Construction Projects, FHWA, 23 CFR Part 650, Subpart B.; and be in agreement with the stipulations in the National Pollutant Discharge Elimination System (NPDES) permit.

The plan sheets should show the proposed erosion control features and contours. For complex and/or environmentally sensitive projects also include topsoil, permanent seeding, and mulching locations in the erosion control section rather than the plan profile section.

g. Materials Sources. When a material source is included, show the following:

- ' Baseline (Survey Data)
- ' Contours
- ' Disturbance limits
- ' Boundaries of the materials source
- ' Boundaries of main extraction area
- ' Maximum final slope ratio
- ' Rehabilitation Plan
- ' Geotechnical information
- ' Stripping notes
- ' Seeding plan
- ' Borehole locations
- ' Typical section for source development including benching requirements

h. Drainage. This section consists of the Tabulation of Drainage Quantities, details of large culvert installations , headwalls, inlet and outlet treatments, fish passage requirements, energy dissipators, catch basins, manholes, and other drainage installations. Drainage standard drawings should also be included in this section.

The Tabulation of Drainage Quantities sheet lists all permanent culverts and related drainage data. Show the location of the drainage installation under the station heading. Show related data in the row across the sheet under an appropriate column heading. Total the figures in the various columns to obtain the quantities to show on the summary of quantities sheet for the appropriate culvert item.

Provide drainage cross-sections for all culverts greater than 1200 mm (48 inches). Show skew angle measured from a line perpendicular to centerline.

i. Other Sections. Provide separate sections for safety features (Items 617, 618, etc.), fences and related items (Items 619), and other items of work not described in other parts of the plans. These sections should contain the standard plans and other details pertaining to the work. Individual detail sheets that do not fit well into other sections may be placed in a Miscellaneous Details section.

j. Wetland Mitigation. Plan sheets for wetland replacement or mitigation are special drawings that detail all work required to ensure successful mitigation. These may range from simple sketches to elaborate contour grading and planting plans which conform to the commitments in the environmental document.

k. Landscaping Plans. Provide plan sheets and details showing the proposed landscaping plan.

l. Temporary Traffic Control. Provide details to assure safe passage of traffic through a specific project construction zone. Use a table format to list the required traffic control devices and signs. For most low volume roads provide standard traffic control layouts that conform to the MUTCD. For areas with complex traffic control, graphically portray the striping and traffic control device locations. For projects with complex schedules, provide a complete work schedule summary showing work restrictions such as road closures and environmental restrictions either in the specifications or the plan sheets.

m. Permanent Traffic Control. Provide tables and details showing the permanent pavement marking, sign, object marker, and delineator locations. For complex areas provide a graphical plan showing the proposed striping and sign locations in addition to the tables.

n. Bridges. Most bridges and other large structures are designed by the Bridge design units. Number the drawings properly for insertion in the final package. Structure sheets may be inserted into the plan package anywhere following the plan-profile sheets.

o. Contiguous Projects. A general plan or layout of contiguous construction projects may be beneficial to potential bidders in determining the cost of work on WFLHD projects. This is particularly true where another agency is constructing a project that will affect WFLHD contractors. It is essential that the relationship between the projects be well detailed on the plans.

There are instances where as-constructed plans should be included in the contract plan package. If a bridge or other structure is scheduled for salvage, a set of the as-constructed plans will greatly assist a contractor in determining the most effective method to disassemble the structure.

On occasion, right-of-way plans or utility plans may be too complicated to incorporate on the plan and profile sheets. They could be inserted into the plans under this subject area.

Figure H
INDEX OF SAMPLE PROJECT PLANS

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